Original Article

Ventrogluteal region, an alternative location to apply benzathine penicillin

Ensaio clínico controlado randomizado: região ventro glútea, local alternativo para aplicação da benzilpenicilina benzatina G

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ABSTRACT

The objective of this study was to compare the pain level related to the administration of benzathine penicillin on the ventrogluteal (VG) and dorsogluteal (DG) region. A randomized controlled trial. Sixty-one people participated in the study, 31 on the intervention group (VG region), and 30 on the control (DG region). The Chi-Squared and Mann-Whitney tests were used to test differences of proportions and to compare central tendencies between groups, respectively. Values of $p < 0.05$ were considered statistically significant. At the three assessed moments, the mean score of pain was higher when the application of the drug was on the VG region vs. DG. At the first and third minute, the difference was statistically significant. These results confirm the VG region as alternative place with less local reaction to apply intramuscular injections.

Descriptors: Penicillin G; Pain; Nursing Care; Injections, Intramuscular.

RESUMO

O objetivo deste estudo foi comparar o nível de dor relacionada à administração da Benzilpenicilina Benzatina G nas regiões ventro glútea (VG) e dorso glútea (DG). Ensaio clínico controlado randomizado. Participaram do estudo 61 pessoas, 31 do grupo de intervenção (região VG) e 30 do grupo controle (região DG). O teste de qui-quadrado e Mann–Whitney foram utilizados para testar diferenças entre proporções e comparar tendências centrais entre os grupos, respectivamente. Valores de $p < 0,05$ foram considerados estatisticamente significantes. Nos três momentos avaliados, a média do escore de dor foi maior quando a aplicação do fármaco ocorreu na região VG vs. DG. No primeiro e terceiro minuto a diferença foi estatisticamente significativa. Estes resultados ratificam a região VG como local alternativo com menor reação local para aplicação de injeções intramusculares.

Descritores: Penicilina G; Dor; Cuidados de Enfermagem; Injeções Intramusculares.

INTRODUCTION

The administration of injecting drugs via intramuscular (IM) is one of the most used practices in nursing routine. Thus, the place chosen to apply the injection is determinant for the patient's safety, for the therapeutic results as well as for the prevention of undesirable adverse events, requesting the site selection to be based on scientific evidence[1].

The use of injections via IM in urgency and emergency units is very common to alleviate pain, or even to obtain therapeutic results quickly[2]. The Benzathine penicillin is a ß-lactam antibiotic with bactericidal action and, when administered via IM, creates a deposit in the muscular tissues and, from those, it is slowly absorbed[3]. The use of this medication was amplified since its availability in 1940's decade, and nowadays it is one of the most prescribed at urgency and emergency units[4-5].

Because it is the choice medication to treat many diseases, as syphilis, infections caused by *Streptococos pyogenes* and pneumococcus, and rheumatic fever, and prophylaxis of acute proliferative glomerulonephritis, it is one of the most used antimicrobial in public health networks[6-7].

The therapeutic success of medications fundamentally depends of its adequate administration. The IM via is a very used procedure, and the nursing professional is the main responsible for its execution that should be based on technical knowledge and scientific evidence[8]. The Benzathine penicillin administration is indicated on the gluteus muscle region, and this is divided into two application sites for IM injections: ventrogluteal (VG) and dorsogluteal (DG) [9].

The DG site is traditionally more used to apply injections of oily, milky, and irritating medications, with volume equal or less than 4 mL[8]. However, this site has been associated with intense local pain, with or without irradiation, during or immediately after the drug application, and it can presents blush, bruises, nodules, paresis and paralysis or necrosis[8,10-11]. The injuries produced by injections depend on where the needle was inserted and the agent injected[12]. The application site of the DG injection is close to large nerves and blood vases as the sciatic and the gluteus, besides presenting a thick layer of subcutaneous tissue. Thus, injections applied out of the superior external gluteus quadrant are the main cause of neural and vascular lesions[9,12].

In accordance with the literature, the VG site is an alternate and safe region for IM injections[10,12-15], and it is delimitated by the anterosuperior iliac spine; great trochanter and superior iliac crest[13,16], and it is recommended for the administration of injecting drugs in individuals of all ages, including seniors, thin individuals and children[11-13,17]. In Brazil, the VG site was inserted in the nursing practice for almost 30 years[13].

For many authors, the VG site have been referred as the first choice to administer IM injections, due to advantages presented when compared to other preconized regions for IM injections, especially, the traditionally used DG region[8-11]. This region has deep musculature with muscle bundles in adequate directions, with thin subcutaneous tissue, sealed by a bone box that prevents slippage of the injected material. Besides, the absence of nerves and thick vases at the place impedes the occurrence of important neural and vascular lesions even with a mal-directed needle, therefore related to less pain when compared to other regions[9,12-13,16]. Additionally, the local epidermis is poorer in anaerobic pathogenic germs due to the anatomical location, therefore reducing the risk of infection associated to the injection[13].

Pain is an important factor that can cause fear in patients, and the drug volume, the needle, the technique, the chemical composition of the drug or solution, the application location and the speed in which the drug is administered can favor its intensity[18].

The literature refers the VG site as the safer location to apply injections, and it is also related to less pain[7,10-11,13,15,17-18]. The Benzathine penicillin is commonly known as a drug that produce local reaction and intense pain, and not rarely, there is prescription of more than one

dose of this drug to the patient, and it is more commonly administered at the DG site, where there is higher risk of neural and vascular lesion due to its location[9-10,12]. Thus, an alternate safe place to administer the drug and to produce reduced pain is necessary to offer comfort to the patient and to prevent potential harms.

The objective of this study was to compare the pain level related to the administration of intramuscular injections of Benzathine penicillin in the ventral gluteus versus dorsal gluteus sites.

METHODS

A randomized controlled trial to assess the pain level related to the administration of Benzathine penicillin on the VG and DG sites. This study was registered at ReBEC (Brazilian Registry of Clinical Trials), nº RBR-3hf227.

The population was constituted of adults using Benzathine penicillin via IM, attended in two health units at a capital of a Central-Western region of Brazil, from 25th of January until the 1st of March, 2012. The inclusion criteria for the study were: to have a prescription of Benzathine penicillin, to have at least 18 years and maximum of 60 years of age. The exclusion criteria were: to have skin lesion close to the application region, to present a prescription of a drug associated to Benzathine penicillin, and to not be able to verbalize the pain sensation in accordance with the pain scale presented.

Sixty-one individuals using Benzathine penicillin via IM were recruited, being 31 for the intervention group (VG site) vs. 30 to the control group (DG site). Yet, three participants dropped from completing the assessment.

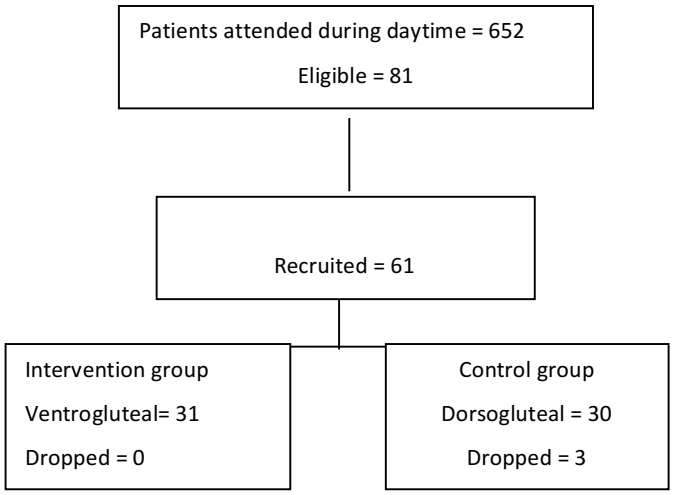

Figure 1: Fluxogram of study participants. Goiânia-GO, Brazil, 2012.

The outcome variable was pain intensity at the application site of each region. The variables measured were: sociodemographic (gender, age, color, marital status and origin), pain related (at the moment, one and three minutes after the injection application).

Random numbers of a statistical program were used for randomization, they were placed in brown sealed envelopes by an external research team member, and placed in a box. All individuals presenting the required criteria were invited to participate and after the explanation about the project and signature of the Free and Informed Consent, they were referred to the injection application.

At the injection room, under supervision of an external research member, the participant removed one envelope from the box with the random numbers, defining the application site, and then, the data was registered in a questionnaire, and it stayed with the external member. To assess pain, it was used the unidimensional numeric scale graduated from zero to 10, where zero means absence of pain and 10, the worse imaginable pain[19]. After the injection and under the

supervision of researchers, the pain assessment was conducted at the moment of the application, after one and three minutes.

To administer the injection at the VG site, the individual was comfortably positioned in the chair, with the leg anatomically flexed. After, the anterosuperior iliac spine was located with the index finger (right hand at the left hip) extending the middle finger until the tubercle of the iliac crest, thus, forming a triangle. The injection was applied at the center of the triangle area formed by the index and middle fingers, that is, the medication was deposited at the iliac cavity (the location with major muscle mass). A hypodermic needle of 25 x 8.0 mm was used for patients weighting ≤ 70 kg or 30x 8.0 mm for those weighting ≥ 70 Kg, in an 85º angle with the needle extremity directed to the iliac crest.

For the administration at the DG site, the patient was positioned slightly inclined to the front, supporting the body with the hands on a chair, and sustaining the body weight on the opposite leg to the injection application. The application site was limited, imagining a line dividing the gluteus region vertically in half and another line horizontally starting from the gluteal fold, thus, establishing four equal quadrants. A hypodermic needle of 25 x 8.0 mm was used for patients weighting ≤ 70 kg or 30x 8.0 mm for those weighting ≥ 70 Kg in a 90º angle, introducing the needle at the center of the external superior quadrant.

Data from interviews and questionnaires of pain assessment were entered in a microcomputer in a statistical software SPSS version 15.0 for Windows. The analysis was based on the protocol. The technician responsible for data analysis was a team member who did not participate on the previous steps of the study, for better precision and data quality. The Chi-squared test was used to test differences between proportions and Mann-Whitney test was used to compare central tendencies between groups. Values of $p<0,05$ were considered statistically significant.

This study was approved and monitored by the Ethics in Research Committee (CEP) from the Clinical Hospital HC/UFG in 19 of May of 2011, under Protocol CEP/HC/UFG Nº 185/2010.

RESULTS

The characteristics of the two groups are presented in Table 1. As observed in the Table, both groups were comparable, considering gender, color, origin, age, education or family income (p >0,05).

Table 1: Characteristics of participants in the study conducted in two health units at the city of Goiânia, GO, Brazil, 2012.

Variable	Vaccine site				P value
	VG[a] (n=31)		DG[b] (n=27)		
Gender (%)					
Female	12	(38.7)	16	(59.3)	
Male	19	(61.3)	11	(40.7)	0.118
Color (%)					
White	06	(19.4)	02	(7.4)	0.516
Black/Brown	24	(77.4)	23	(85.2)	
Yellow	01	(3.2)	02	(7.4)	
Origin (%)					**0.735**
Goiás	17	(54.8)	16	(59.3)	
Another state	14	(45.2)	11	(40.7)	
Marital status					
Married/living together	15	(48.4)	13	(48.1)	0.832
Widowed/separated	05	(16.1)	03	(11.1)	
Single	11	(35.5)	11	(40.7)	
Age	32.52	(12.65)	35.67	(15.92)	0.405
Study time (mean; SD[c])	3.48	(1.12)	3.63	(0.79)	0.575
Family income (mean; SD)	2.32	(1.30)	2.44	(1.25)	0.719

[a] VG: ventrogluteal; [b] DG: dorsogluteal; [c] SD: standard deviation

In all three assessment moments, the mean pain score was higher when the drug was applied in the DG site compared to the VG site, and this difference was statistically significant, in the first (p= 0.046) and third minute (p=0.02) after the drug injection, Table 2.

Table 2: Pain at the intramuscular injection site in individuals who received Benzathine penicillin at the ventrogluteal site versus dorsogluteal site in a study conducted in two health units at the city of Goiânia, GO, Brazil, 2012.

Pain scores	VG[a] (n=31)		DG[b](n=27)		Z[c]	p-value
	Mean	SD*	*Mean*	SD		
During the injection	1.84	1.53	2.59	1.45	-1.88	0.06
1' after the injection	0.68	1.04	1.26	1.23	- 2.00	0.046
3' after the injection	0.23	0.56	0.78	1.05	-2.26	0.024

[a] VG: ventrogluteal; [b] VD: dorsogluteal; [c] Mann-whitney; * SD Standard Deviation

DISCUSSION

The Benzathine penicillin is a very used antibiotic in urgencies and emergencies units in public health, as it is essential to fight many infections of community origin[20-21], however, adverse reactions have been registered since its introduction in clinical practice[11,18,21].

The adequate choice to administer intramuscular injections is of great importance to decrease pain and other adverse events, especially produced by viscous drugs, thus administration of these drugs with greater safety and less pain became the great challenge of the nursing team[3,8-9].

In the present study, contrary of Tugˇrul and Khorshıd (2014) that did not find difference in pain intensity during the application of procaine penicillin in adults using these two sites[22]; the assessment during the injection application showed a tendency of less pain for individuals who received the injection in the VG site vs. DG, with a marginal p value (0.06).

In this study, lower scores after the application of Benzathine penicillin were found in individuals who received the medication on the VG site, at the first as well as on the third minute. This difference is possibly related to VG anatomic characteristics. The region is delimited by a bone box (iliac crest, anterosuperior iliac spine and greater trochanter), larger volume of muscle mass (medius and minimus muscle), and the direction of muscle fibers prevent the slippage of the injected material to the sciatic nerve region, preventing it from irritations[11,13-14,16].

It is not new that Benzathine penicillin injections make patients apprehensive, justified by testimonials of previous experiences from the patient and from people of their familiarity, who describe pain as almost unbearable, as it has a neurotoxic characteristic. In this context, the VG site is presented as alternative because it is less innervated, and it is cited as the region of less pain sensitivity[11-17].

Besides the less pain advantage at the injection site, studies with immune-biologicals show that less reactogenicity was found in neonates and lactating when compared to other sites traditionally used for this age, as the anterolateral thigh (ALT)[15-17], showing this site as safe to also apply vaccines in neonates.

Still, the reality of emergency units present patients with diverse characteristics, as gluteus prosthesis, skin lesions, rickets or obesity, that in many times making impossible to administer viscous drugs with safety on the DG site.

In this study, the adherence of patients to VG was unanimous, it is believed that attention, and adequate information provided by professionals who administered the injection to participants was fundamental for its acceptance. Safe guidance regarding innovative techniques is necessary to acquire trust and consequently, offer more comfort to the patient.

There are few studies that assessed pain during the IM injection applications comparing sites for drug administration. The present study is expected to add to others defending the need of an alternative site for injections via IM that produce less pain associated to safety.

Limitations of the study: the researcher was not blinded to pain assessment, considering the group in which the participant was allocated. Individuals who received Benzathine penicillin injections previously, were not excluded from the study and their previous experience might have affected the pain assessment.

Nowadays, the evidence-based practice is required for nursing action, and the administration of injecting drugs via IM should follow this axis, leaving the convenience of traditionalism and professional preference to adopt innovative techniques to guarantee safety and more comfort to the patient.

CONCLUSION

When pain and application site for medication are compared, the results presented scores of less pain for the VG site, and the difference was statistically significant at the first and third minute (p<0,05).

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